

Upper Mississippi River Nine-Foot Channel Project,
Lock and Dam No. 27
Granite City
Madison County, Illinois
St. Louis County, Missouri

HAER No. IL-33

HAER
ILL,
60-GRACI,
2-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
Rocky Mountain Regional Office
National Park Service
U. S. Department of the Interior
P.O. Box 25287
Denver, Colorado 80225

HISTORIC AMERICAN ENGINEERING RECORD

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Location: The lock site is located near the southern end of the 8.4-mile long Chain of Rocks Canal, 185.5 miles above the mouth of the Ohio River. The canal passes through low-lying flood plain and is bordered by earth dikes. The dam is located on the Mississippi River, 190.2 miles above the mouth of the Ohio River, immediately downstream from Homer Dike, Intake Tower Nos. 1 and 2 of the St. Louis Water Works, the Chain of Rocks Bridge, and Interstate Highway 270 Bridge.

Date of Construction: 1947-1964

Architect/Engineer: U. S. Army Corps of Engineers

Builder: River Construction Corporation

Present Owner: St. Louis District
U. S. Army Corps of Engineers
U. S. Government

Present Use: River navigation and control

Significance: Addition to Nine-Foot Channel Project (1927-1940)

The Upper Mississippi River Nine-Foot Channel Project represents one of the largest and most ambitious river improvement projects ever constructed in the United States. The project's origins date to the 1920s and the efforts of Upper Midwest commercial interests to improve their access to markets. During the early years of the Great Depression, the project became transformed into a massive public works program intended to relieve local and regional unemployment.

The locks and dams that comprise the project constitute seminal developments in the technological history of American river navigation projects. The project pioneered the use of non-navigable movable dams in the United States. Designers and engineers from the United States Army Corps of Engineers committed themselves to a foreign technology by their decision to incorporate roller gates into the majority of the project's dams and, more importantly, developed new and improved versions of the simpler and more reliable Tainter gate at such a rapid rate that by the end of the 1930s, roller gates had become a passe' technology.

The successful completion of the Nine-Foot Channel Project transformed the Upper Mississippi River into an intra-continental canal, providing a fully navigable interior river system throughout the Midwest. The project significantly altered the environment of the Upper Mississippi, but it also served as an impetus for the improvement of drinking water and sewage disposal systems in towns and cities

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located along the river. Additionally, the project provided new recreational opportunities to the general public.

Lock and Dam No. 27 constitute additions to the original Upper Mississippi Nine-Foot Channel Project, constructed after World War II. Lock No. 27, located on the Chain of Rocks Canal, provided the last link in the nine-foot channel, facilitating safe passage around the dangerous Chain of Rocks Reach. The design and construction of the locks incorporated various engineering and technological lessons and advances learned during the completion of the earlier elements of the project during the 1930s.

Dam No. 27, constructed in the early 1960s, provides additional depth of water in the pool, extending upstream to Lock and Dam No. 26, facilitating more efficient operation of that installation. Dam No. 27 is the first dam ever constructed completed across the Mississippi River. It is emblematic of the continued efforts to refine and improve the nine-foot channel.

Historians:

Patrick W. O'Bannon
July 1989

PART I. HISTORICAL INFORMATION

A. Physical History

1. Dates of Erection: 1947-1964
2. Architect-Engineer: U. S. Army Corps of Engineers
3. Original and Subsequent Owners: U. S. Government
4. Builders, Contractors, Suppliers
 - a. General Contractor -- lock construction: River Construction Corporation
 - b. Subcontractors -- lock construction: American Bridge Company (steel fabrication and erection), LaCrosse Dredging Company (dredged fill and excavation), McWilliam Dredging Company (dredging of Chain of Rocks Canal), East St. Louis Stone Company (aggregate), Columbia Quarry Company (aggregate), The Ornamental Iron Work Company (gratings and grills), Batzli Electric Corporation (power, control and lighting), American Hoist & Derrick Company (stiffleg derrick and culvert bulkhead handling crane), Foote Bros. Gear & Machine Corporation (operating machinery for lock gates, Tainter valves, and bridge), Omaha Steel Works (floating mooring bits, lift gate reaction rollers)
 - c. General Contractor -- dam construction: Unknown
 - d. Subcontractors -- dam construction: Unknown
5. Original Plans and Construction: U.S. Army Corps of Engineers
6. Alterations and Additions:

<u>Item</u>	<u>Year</u>
Radio tower constructed	1952
Alterations to both sets of upper gates and sills. Work included addition of buoyancy chambers, reinforcement with steel plates, new paint	1960
Navigation warning signs	1960
Access road resurfaced	1962
Auxiliary lock altered. West wall raised in height. New, taller miter gates installed	1963
Repairs and alterations to main lock. Work included new concrete, wall protection, painting of lift gate, and provision of drain holes in sill	1966
Upper guide wall constructed	1971

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Navigation alignment cell constructed	1971
Building roofs repaired and resurfaced	1972
Provision of security fence around site	1972
Lower guide wall constructed	1972
Upper gate sill reinforced	1972
Television camera installed for monitoring of operations by lockmen	1973
Lock walls repaired and culvert Tainter valves painted	1977
Emergency bulkheads rehabilitated	1978
Electrical transformers replaced	1981
Culvert Tainter valves rehabilitated	1982
Repairs to auxiliary lock wall protection	1984
Guide cell constructed at lower approach	1985
Repairs to lower sill tie downs	1986

B. Historical Context

Lock No. 27 represents the first major addition to the Upper Mississippi River Nine-Foot Channel Project. Authorized prior to the outbreak of World War II, work on the installation did not begin until July 1947. The locks are located at the lower end of the Chain of Rocks Canal, which permitted river traffic to bypass the shallows located of Chain of Rocks Reach. Construction of the canal commenced in July 1949 and the canal and locks were placed in service in February 1953.

The locks installation consists of a main lock, measuring 1,200 feet in length and 110 feet in width, and an auxiliary lock measuring 600 feet by 110 feet. Dam No. 27 is located in the Mississippi River just below the Chain of Rocks Highway Bridge. It is a low water dam, approximately 2,500 feet long, extending entirely across the river and designed to provide additional depth of water at the lower gate sills of Lock No. 26, located upstream at Alton, Illinois. Constructed during the early 1960s, the dam has virtually no impact upon operations within the Chain of Rocks Canal or at Lock No. 27.

The main lock is 1,200 feet long, twice the length of the locks constructed as part of the Upper Mississippi River Nine-Foot Channel Project during the 1930s. The longer chamber eliminated the need to break apart long strings of barges and pass them through the locks in two separate cuts. the auxiliary lock chamber measures 110 feet in width and 600 feet in length, the same dimensions as the main locks constructed during the 1930s. Both lock chambers were excavated to bedrock, which serves as the lock chamber floor. the locks are flooded and emptied by means of longitudinal culverts located in the lock walls. The culverts are square in section, measuring 14'x14' in the east and intermediate walls, and 18'x18' in the west wall. The intakes are located in the lock floors, directly above the upper gates of each chamber. A complex system of crossovers, diffusers, and manifolds is used to direct the water into and out of the lock chambers with minimal turbulence. Six electrically-operated Tainter valves, located in the lock walls, control the flow of water in the culverts.

Dam No. 27 is a low water dam extending entirely across the Mississippi River. It consists of three distinct sections. At the east end of the dam are ten sand and gravel-filled steel sheet pile cells, extending approximately 600 feet into the river. The cells abut a rock-filled section, approximately 1,100 feet long, that incorporates a 676-foot long spillway. An additional 325 feet of rockfilled dam extends at a slight angle downstream to a connection with the third section of the structure, a concrete dam that extends approximately 540 feet to the west bank of the river.

PART II. TECHNOLOGICAL INFORMATION -- LOCK

A. General Statement:

1. Architectural character: Enlarged and improved variation on standardized Ohio-Mississippi lock design. Drawing M-L 27 20/1A, M-L 27 20/19.
2. Condition of fabric: Good.

B. Description of General Layout and Principal Elements:

1. Overall dimensions: Main Lock -- 110 feet by 1,200 feet. Auxiliary lock -- 110 feet by 600 feet. Drawing M-L 27 20/1A.
2. Foundations: Bedrock foundation. Concrete keyed into rock. Drawing M-L 27 20/1A.
3. Walls: Monolithic reinforced concrete with steel wall armor. Drawing M-L 27 20/1A, M-L 27 20/19.
4. Structural system: Monolithic reinforced concrete.
5. Upper and lower guide walls: Monolithic reinforced concrete construction, extensions to upper end of intermediate wall and lower end of east wall designed to assist traffic in entering the chambers.
6. Lower east wall control house -- exterior: Standardized construction. Flat roof with parapet. Buff brick walls with concrete and cast stone trim. Original industrial metal sash and modern aluminum replacement windows. Drawings M-L 27 70/0.
 - a. Interior: Contains control board, switchboard, toilet, and stairway access to lock wall galleries.
7. Upper intermediate wall control house -- exterior: Standardized construction. Flat roof with parapet. Buff brick walls with concrete and cast stone trim. Original industrial metal sash and modern aluminum windows. Drawings M-L 27 70/0.
 - a. Interior: Contain control boards, switchboard, toilet, and stairway access to lock wall galleries.
8. Middle intermediate wall control house - exterior: Standardized construction. Flat roof with parapet. Buff brick walls with concrete and cast stone trim. Original industrial metal sash and modern aluminum windows. Drawings M-L 27 70/0.
 - a. Interior: Contain control boards, switchboard, toilet, and stairway access to lock wall galleries.

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9. Lower intermediate wall control house -- exterior: Standardized construction. Flat roof with parapet. Buff brick walls with concrete and cast stone trim. Original industrial metal sash and modern aluminum replacement windows. Drawings M-L 27 70/0.

a. Interior: Contains control board, switchboard, toilet, and stairway access to lock wall galleries.

10. Upper west wall control house -- exterior: Standardized construction. Flat roof with parapet. Buff brick walls with concrete and cast stone trim. Original industrial metal sash and modern aluminum windows. Drawings M-L 27 70/0.

a. Interior: Contain control boards, switchboard, toilet, and stairway access to lock wall galleries.

11. Upper west wall crane machinery room: Standardized construction. Flat roof with parapet. Buff brick walls with concrete and cast stone trim. Industrial metal sash windows.

Drawings M-L 27 70/0.

a. Interior: Contain control boards, switchboard, toilet, and stairway access to lock wall galleries.

C. Mechanical Equipment:

1. Tainter valves: Six electrically-operated, steel Tainter valves connected to motors by metal struts, located in upper and lower ends of lock walls. Drawings M-L 27 20/1A, M-L 27 25/1, M-L 27 26/1.

2. Lock Gates:

Miter gates -- lower gates for both main and auxiliary lock consist of two-leaf Miter gates balanced on stainless steel pintels. Gates are electrically operated by means of steel sector gears and struts. Motor assemblies housed in machinery rooms buried within lock walls adjacent to each gate leaf. Oak timber fenders on gate faces. The main lock gates are approximately 40 feet tall. Drawings M-L 27 21/1, M-L 27 22/1.

Lift gates - upper gates for both main and auxiliary locks are two-leaf vertical lift gates. each leaf is thirty feet tall. the downstream leaf, positioned directly behind the upstream leaf is raised and lowered by means of an electrically-operated chain hoists. The leaf rides up and down within the gate recesses in the lock walls on reaction rollers. a hinged nappe atop the downstream leaf provides additional height for the gate during periods of ice or high water. Motor assemblies and counterweights are housed in machinery rooms buried within the lock walls adjacent to each leaf. Drawings M-L 27 21/31, M-L 27 22/51.

3. Lighting: Various free-standing single- and double-head lighting standards.

4. Plumbing: Lock chambers are watered by means of longitudinal culverts located in lock

walls. Culverts are square in section, measuring 14'x14' in the east and intermediate walls and 18'x18' in the west wall. Tainter valves (described above) control the flow of water in the culverts.. Drawings M-L 27 20/1A, M-L 27 20/19, M-L 27 20/33, M-L 27 20/51, M-L 27 25/1, M-L 27 26/1.

5. Lock bulkheads: Temporary blocking units of structural steel girder construction used to block upper lock openings during emergencies or for repairs. Drawing M-L 27 35/1.
6. Stiffleg derrick: Stiffleg derrick with 45-foot boom located at upper end of east wall. Used to place and remove lock bulkheads. Drawing M-L 27 35/1.

PART III. TECHNOLOGICAL INFORMATION -- LOW WATER DAM

A. General Statement:

1. Architectural character: Low water dam consisting of concrete, rock-fill, and steel sheet pile cell sections. Structure is largely not visible, being principally located below water. Drawing M-L 27 15/1.
2. Condition of fabric: good

B. Description of Exterior:

1. Overall dimensions: Approximately 2,500 feet in length. Drawing M-L 27 15/1.
2. Foundations: Excavation to rock, steel sheet pile cells in sand.
3. Structural system: Monolithic reinforced concrete, rock-fill, and sand and gravel-filled steel sheet piles. M-L 27 15/1.

C. Description of General Layout and Principal Elements:

1. Access plans: access to dam is from the east, off of Chain of Rocks Road.

D. Other Elements:

1. Revetments: Derrick-placed stone revetment located along east bank of river below dam. Hand-placed stone revetment located along west bank of river below dam. Drawing M-L 27 15/1.
2. Homer dike: Derrick-placed stone dike projecting approximately 1,000 feet into river from west shore immediately upstream from dam. The dike predates the dam. Its only association with the dam is locational. Drawing M-L 27 15/1.

PART IV. TECHNOLOGICAL INFORMATION -- ESPLANADE AREA

A. Description of Esplanade -- General Layout

1. Design character: Standardized park/service area component. Originally designed to accommodate the comfort station, storage building, and upper east wall control house, as well as various service-related functions. Drawing M-L 27 70/0.
2. Historic landscape design: Based on standardized designs.

B. Condition of Site and Structures: Altered

1. Upper east wall control house -- exterior: Standardized construction. Flat roof with parapet. Buff brick walls with concrete and cast stone trim. Glass block and industrial metal sash windows. Drawings M-L 27 70/0, M-L 27 70/1, M-L 27 70/3, M-L 27 70/4.
 - a. First floor - interior: Contains control room, with switchboard, offices, toilet room, stairway access to basement, and former shop area presently used as a visitors' center. Drawings M-L 27 70/1, M-L 27 70/3, M-L 25 70/4.
 - b. Basement -- interior: Provides access to machinery rooms and galleries extending through lock walls. Drawing M-L 27 70/1.
2. Upper east wall crane machinery room -- exterior: Standardized construction. Flat roof with parapet. Buff brick walls with concrete and cast stone trim. Industrial metal sash windows. Drawings M-L 27 70/0, M-L 27 70/1, M-L 27 70/3, M-L 25 70/4.
 - a. interior: Contains machinery for stiffleg derrick. Drawing M-L 27 70/1.
3. Comfort station: Standardized construction. Flat roof with parapet. Buff brick walls with concrete and cast stone trim. Industrial metal sash windows. Drawing M-L 27 70/0.
4. Storage building: Standardized construction. Flat roof with parapet. Buff brick walls with concrete and cast stone trim. Glass block and industrial metal sash windows. Drawing M-L 27 70/0.
5. Outbuildings: Various service buildings and sheds erected over time. None have particular significance or contribute to the character of the site.
6. Observation deck: Raised observation deck located along east lock wall below upper east wall control house.

PART V. SOURCES OF INFORMATION

- A. Original architectural drawings: Construction drawings, Mississippi River Lock & Dam No. 27, half-size copies on file at St. Louis District Office. Additional copies, as well as additional assorted drawings, are on file at the site.
- B. Historic views: Construction photographs -- twelve bound notebooks on file at site.
- C. Interviews: Personnel, Lock and Dam No. 27.
- D. Bibliography:
 - 1. Primary and unpublished sources: assorted files and records held at the site and at the St. Louis District Office. see bibliography to HAER No. MO-50, Narrative History.
- E. Likely sources not yet investigated: National Archives, record Group 77, Kansas City, Missouri. The holdings for the St. Louis District are presently unprocessed. A preliminary investigation of more than 50 boxes of material failed to yield any significant information on the Nine-Foot Channel Project. However, the processed records will be much easier to use and may provide additional data.
- F. Supplemental Material: Aerial Photographs, U.S. Army Corps of Engineers, St. Louis District.

LOCK AND DAM NOS. 24 THROUGH 27 -- INDIVIDUAL SIGNIFICANCE AND INVENTORIES

This report is part of the documentation that outlines the specific technological component of each lock and dam complex, with particular emphasis upon significant and unique engineering elements. Additions and alterations to the various components comprising the individual complexes are also described in this documentation. The principal sources for information pertaining to these additions and alterations are the engineering drawings prepared for individual projects and the detailed repair and maintenance records held at each site. These sources do not comprehensively document the myriad changes, many of a decidedly superficial nature, made to each complex since its construction. Nevertheless, they constitute the only available record of these changes.

Dates for the construction of each complex are given from the onset of work to the completion of the complex and do not necessarily reflect the construction dates for any single element of the installation. Final construction reports survive for Lock and Dam No. 26, Lock No. 25, and Lock No. 24. These reports, held either at the individual sites or at the St. Louis District Office of the Corps of Engineers, concentrate almost exclusively on the actual construction process. The final construction reports include comprehensive lists of contractors and material suppliers, but contain only limited information pertaining to design, project administration, politics, and environmental issues.

Dimensions for the movable gate sections have been rounded, in accordance with common contemporary practice. For example, roller gates that measure 88 feet 10-1/2 inches in length are identified in construction drawings, completion reports, photographs, and this report, as 80-foot gates. Therefore, all gate measurements should be considered approximate rather than absolute.

Users of this documentation should note that, although many of the complexes appear identical, some architectural and engineering components vary significantly between complexes. This variation is most obvious in the disparity between the appearance of the three installations, Lock and Dam Nos. 24-26, constructed during the 1930s, with Lock and Dam Nos. 26R and 27, constructed after World War II. However, there are subtle variations in the design of gate piers, gates, control stations, and other elements at each of the three 1930s installations. These variations largely reflect improvements in engineering practice that permitted the elimination of structurally unnecessary material. The open design of the Tainter gate piers at Dam No. 24, as contrasted with the more massive, monolithic design at the earlier Dam No. 26, provides perhaps the most obvious example of this type of variation. A fuller discussion of the architectural and engineering evolution of the St. Louis District installations is included within the narrative history portion of this documentation.